

04-NOV-09  
10:23:48

GEORGIA DEPARTMENT OF TRANSPORTATION  
PRECONSTRUCTION DIVISION - OFFICE OF BRIDGE & STRUCTURAL DESIGN  
THE ANALYSIS AND DESIGN OF PIERS FOR BRIDGES - V 4.2.07 - AASHTO SPECS 1984 INTERIM  
REVISED: JUNE 30, 2008  
36' CURB-CURB; 5 BEAMS; 120' SPAN; 60' TALL; BRIDGE 15 ; PIER 14

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C PSI	FC PSI	N	FY PSI	FS PSI	DESIGN DATA		CONC.	Z	* * * CAP			REINFORCING STEEL		* * * CAP					
OPTIONS											EC KSI	ES KSI	STRAIN	FACT	MAIN SIZE	STR SIZE	MAX TOP	MAX BOT	MIN SIZE	MIN NO.	MIN TOP	MIN CL.	MIN S.SP	MIN INCR.	MIN CL.
D D D L	2	1	12	0-00-00		3500.	1400.	8.	60000.	24000.	3409.	29000.	0.0030	170.	11	5	16	16	11	2	2.00	4.00	3.00	2.00	

COLUMN	REINFORCING	STEEL	R	KL	OC	OF	CM	BD1	BD2	IMPACT	SOIL	WT	ALL.S.P.	MIN	MAX	EDGE	PILE	REBAR	ALL.PILE	ALL.PILE	I
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF	PL SP	PL SP	PL SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT	P
1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	18.87	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000	-9.999	

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	19.625	4.000	4.000	6.000	6.000	4.000	15.625	16.000	8.000	4.000					
12	2	SAME AS CANTILEVER 1														

COLUMN DATA

CN	P	I	T	S	HT	A	DT	BT	DB	BB	DL	FLEX	ND	NB	SZ	ND	NB	SZ	ND	NB	SZ	SLOPE	EP	AP			
21	1	C	T		60.000	0.000	8.000	6.000	8.000	6.000	6.000	0.000	8	6	11	8	6	11	22	16	11	22	16	11	0.000	0.000	0.000

FOOTING DATA

CN	S/P	B	D	T	DEL.B	DEL.D	DEL.T	R.B/D	R.D/B	S.HT.	NP	SYM.	BP	DP	SET.
31	P	10.000	10.000	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

GROUP II WIND INTENSITIES

WIND	TRANS.	LONG.	WIND	FT1	FT1	WIND	FT2	FT2	FT3	FT3	FT4	FT4	FT5	FT5	* WIND	FORCE	ARM	* WIND	ON	PIER
															APT	APL	PT	PT	PL	PL
1170.	2340.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	7.676	17.595				

GROUP III WIND INTENSITIES

STD.	* WIND	ON	SUPERSTRUCTURE	INTENSITIES	* STD.	* WIND	ON	LIVE	LOAD	INTENSITIES	* LENGTHS	OF	LL	* WIND	ON	LL	ARMS								
WIND	FT1	FT1	FT2	FT2	FT3	FT3	FT4	FT4	FT5	FT5	TRANS.	LONGI.	APT	APT	APT	APT	APT								
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	120.0	240.0	15.583	15.583

MISCELLANEOUS FORCES

CENTRI.	TRACTION	FORCE	AND	ARMS	EXPANSION	SHRINKAGE	STREAM	FLOW
FT	FL	APT	APL	COEFFICIENT	COEFFICIENT	PT	PL	
0.000	8.580	15.583	15.583	0.00018000	0.00044000	0.000	0.000	

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES

I.D.	NL	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
D.L.	0	242.607	281.294	0.000	281.294	0.000	281.294	242.607					
LL 1	1	77.588	46.553	0.000	0.000	0.000	0.000	0.000					
LL 2	2	77.588	93.106	0.000	77.588	0.000	0.000	0.000					
LL 3	3	77.588	93.106	0.000	108.624	0.000	77.588	15.517					
LL 4	1	0.000	0.000	0.000	0.000	0.000	46.553	77.588					
LL 5	2	0.000	0.000	0.000	77.588	0.000	93.106	77.588					
LL 6	3	15.517	77.588	0.000	108.624	0.000	93.106	77.588					
LL 7	1	0.000	23.276	0.000	77.588	0.000	23.276	0.000					
LL 8	2	38.794	100.865	0.000	85.347	0.000	23.276	0.000					
LL 9	3	38.794	100.865	0.000	93.106	0.000	100.865	38.794					
LL10	2	0.000	77.588	0.000	93.106	0.000	77.588	0.000					
LL11	2	77.588	46.553	0.000	0.000	0.000	46.553	77.588					
LL12	3	77.588	93.106	0.000	77.588	0.000	46.553	77.588					

COLUMN MOMENTS(KIP- FEET), SHEARS(KIPS), REACTIONS(KIPS)

TRANSVERSE

\* LONGITUDINAL

LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF
UNIT F.AT CL.CAP	1	0.000	-6.000	1.000	60.000	0.000	0.000	0.000	6.000	1.000	60.000	60.000
DEAD LOAD TOTAL	1	1555.446	0.000	0.000	0.000	1944.246	7113.102	-7113.102	0.000	0.000	0.000	0.000
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-185.182	-8.580	-648.502	-648.502
WIND ON SUBSTR.	1	0.000	-46.056	7.676	460.560	0.000	0.000	0.000	-105.570	-17.595	-1055.700	-1055.700
GROUP 2 WIND 1 1	1	0.000	-828.494	66.176	4401.998	0.000	0.000	0.000	-105.570	-17.595	-1055.700	-1055.700
GROUP 2 WIND 1 2	1	0.000	-828.494	66.176	4401.998	0.000	0.000	0.000	105.570	17.595	1055.700	1055.700
GROUP 2 WIND 2 1	1	0.000	-734.601	59.156	3929.025	0.000	0.000	0.000	-293.355	-31.635	-2001.645	-2001.645
GROUP 2 WIND 2 2	1	0.000	-734.601	59.156	3929.025	0.000	0.000	0.000	293.355	31.635	2001.645	2001.645

PIER-36-5-120-60.OUT																
GROUP	WIND	3	1	1	0.000	-687.655	55.646	3692.539	0.000	0.000	0.000	-481.140	-45.675	-2947.590	-2947.590	
GROUP 2	WIND 3 2	1	1	1	0.000	-687.655	55.646	3692.539	0.000	0.000	0.000	481.140	45.675	2947.590	2947.590	
GROUP 2	WIND 4 1	1	1	1	0.000	-562.465	46.286	3061.909	0.000	0.000	0.000	-606.330	-55.035	-3578.220	-3578.220	
GROUP 2	WIND 4 2	1	1	1	0.000	-562.465	46.286	3061.909	0.000	0.000	0.000	606.330	55.035	3578.220	3578.220	
GROUP 2	WIND 5 1	1	1	1	0.000	-312.085	27.566	1800.649	0.000	0.000	0.000	-700.222	-62.055	-4051.192	-4051.192	
GROUP 2	WIND 5 2	1	1	1	0.000	-312.085	27.566	1800.649	0.000	0.000	0.000	700.222	62.055	4051.192	4051.192	
GROUP 3	WIND 1 1	1	1	1	0.000	-507.544	31.853	2227.595	0.000	0.000	0.000	-31.671	-5.279	-316.710	-316.710	
GROUP 3	WIND 1 2	1	1	1	0.000	-507.544	31.853	2227.595	0.000	0.000	0.000	31.671	5.279	316.710	316.710	
GROUP 3	WIND 2 1	1	1	1	0.000	-448.297	28.307	1976.864	0.000	0.000	0.000	-150.166	-12.371	-818.172	-818.172	
GROUP 3	WIND 2 2	1	1	1	0.000	-448.297	28.307	1976.864	0.000	0.000	0.000	150.166	12.371	818.172	818.172	
GROUP 3	WIND 3 1	1	1	1	0.000	-418.673	26.534	1851.498	0.000	0.000	0.000	-268.660	-19.462	-1319.635	-1319.635	
GROUP 3	WIND 3 2	1	1	1	0.000	-418.673	26.534	1851.498	0.000	0.000	0.000	268.660	19.462	1319.635	1319.635	
GROUP 3	WIND 4 1	1	1	1	0.000	-339.677	21.806	1517.190	0.000	0.000	0.000	-347.656	-24.191	-1653.943	-1653.943	
GROUP 3	WIND 4 2	1	1	1	0.000	-339.677	21.806	1517.190	0.000	0.000	0.000	347.656	24.191	1653.943	1653.943	
GROUP 3	WIND 5 1	1	1	1	0.000	-181.684	12.350	848.573	0.000	0.000	0.000	-406.904	-27.736	-1904.675	-1904.675	
GROUP 3	WIND 5 2	1	1	1	0.000	-181.684	12.350	848.573	0.000	0.000	0.000	406.904	27.736	1904.675	1904.675	
LIVE LOAD	LL 1	1	1	1	124.141	-1613.832	0.000	1613.832	124.141	1613.832	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 2	1	1	1	248.282	-1986.256	0.000	1986.256	248.282	1986.256	0.000	0.000	0.000	0.000	0.000	0.000

□ COLUMN MOMENTS (KIP-FEET), SHEARS (KIPS), REACTIONS (KIPS)

LOAD	COL	TRANSVERSE								LONGITUDINAL			
		PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF	
LIVE LOAD LL 3	1	335.181	-1005.552	0.000	1005.552	335.181	1787.630	-782.078	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 4	1	124.141	1613.832	0.000	-1613.832	124.141	0.000	-1613.832	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 5	1	248.282	1986.256	0.000	-1986.256	248.282	0.000	-1986.256	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 6	1	335.181	1005.552	0.000	-1005.552	335.181	782.078	-1787.630	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 7	1	124.140	0.000	0.000	0.000	124.140	186.208	-186.208	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 8	1	248.282	-1241.416	0.000	1241.416	248.282	1427.624	-186.208	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 9	1	335.182	0.000	0.000	0.000	335.182	1284.862	-1284.862	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL10	1	248.282	0.000	0.000	0.000	248.282	620.704	-620.704	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL11	1	248.282	0.000	0.000	0.000	248.282	1613.832	-1613.832	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL12	1	335.181	-335.182	0.000	335.182	335.181	1787.630	-1452.449	0.000	0.000	0.000	0.000	0.000

□ CAP ANALYSIS AND DESIGN DATA

POINT	MOMENTS (KIP-FEET)								SHEARS (KIPS)							
	D.L. TOT.	G1 MAX. +	G1 MAX. -	G2 MAX. +	G2 MAX. -	G3 MAX. +	G3 MAX. -	DL T. LT	DL T. RT	G1 + LT	G1 + RT	G1 - LT	G1 - RT			
P 1	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-18.933	-334.322	-18.933	-334.322	-18.933	-502.766			
P 2	-2917.766	-2917.766	-4265.314	-2917.766	-2917.766	-2917.766	-3724.681	-390.033	-755.715	-390.033	-755.715	-558.476	-1126.292			
P 3	-6009.117	-6009.117	-8838.972	-6009.117	-6009.117	-6009.117	-7703.641	-790.759	-790.759	-790.759	-790.759	-1161.335	-1161.335			
C 1L	-9247.031	-9247.031	-13559.192	-9247.031	-9247.031	-9247.031	-11829.164	-828.199		-828.199		-1198.775				
C 1R	-9247.031	-9247.031	-13559.192	-9247.031	-9247.031	-9247.031	-11829.164		828.199		1198.775		828.199			
P 5	-6009.117	-6009.117	-8838.972	-6009.117	-6009.117	-6009.117	-7703.641	790.759	790.759	1161.335	1161.335	790.759	790.759			
P 6	-2917.766	-2917.766	-4265.315	-2917.766	-2917.766	-2917.766	-3724.682	755.715	390.033	1126.292	558.476	755.715	390.033			
P 7	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	334.322	18.933	502.766	18.933	334.322	18.933			

PT.	UNF. K-FT.		TOP REINFORCE. AS NO. SIZE		BOT. REINFORCE. AS NO. SIZE		CAP DESIGN DATA LEFT STIRRUPS M.SP. AV/IN BAR&SPAC				RIGHT STIRRUPS M.SP. AV/IN BAR&SPAC		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
	M+	M-	AS	NO. SIZE	AS	NO. SIZE	M.SP.	AV/IN	BAR&SPAC	M.SP.	AV/IN	BAR&SPAC					
P 1	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	0.00	0.000	#5@ 0.00	24.00	0.060	#5@10.33	59.14		0.08	0.000	0.099
P 2	-2244.436	-2865.140	12.05	8 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.133	#5@ 4.67	83.71		0.22	0.564	1.247
P 3	-4622.397	-5925.877	21.86	15 # 11	3.12	2 # 11	24.00	0.104	#5@ 5.98	24.00	0.104	#5@ 5.98	96.00		0.36	0.544	0.981
C 1	-7113.102	-9099.357	34.25	22 # 11	3.12	2 # 11	24.00	0.113	#5@ 5.49	24.00	0.113	#5@ 5.49	96.00		0.56	0.602	0.999
P 5	-4622.397	-5925.877	21.86	15 # 11	3.12	2 # 11	24.00	0.104	#5@ 5.98	24.00	0.104	#5@ 5.98	96.00		0.36	0.544	0.981
P 6	-2244.436	-2865.140	12.05	8 # 11	3.12	2 # 11	24.00	0.133	#5@ 4.67	24.00	0.060	#5@10.33	83.71		0.22	0.564	1.247
P 7	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	0.00	0.000	#5@ 0.00	59.14		0.08	0.000	0.099

NOTE: \*\*\* FS/FZ RATIO EXCEEDS 1.0! \*\*\*

□ COLUMN ANALYSIS AND DESIGN OUTPUT

CRITICAL COLUMN LOADS

PIER-36-5-120-60.OUT

CN	T	B	GR	LLC	WC	R	E	C	S	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T		1	LL 2	0.0					2561.1	-4312.2	0.0	2561.1	5269.3	2199.7	7697.3	15837.6	6611.6	3.006	72.00	96.00
1	B		2		4.1					2527.5	3980.5	-4651.7	2527.5	4665.6	6150.5	4750.6	8810.3	11614.3	1.887	72.00	96.00

COLUMN DESIGN DATA

CN	T	B	FACE 1	B	FACE 2	D	FACE 3	D	FACE 4	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC
1	T		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	2814.	15491.	1.222	1.432	1.000	2	0.70
1	B		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	2275.	15491.	1.172	1.322	1.000	2	0.70

FOOTING 1 DESIGN LOADS

F	G	LLID	WC	ES	C	S	P	MT	VT	ML	VL	P4	P3	P2	P1	MTF	VBF	VPF	LOAD
1	3	LL 2	3.1				2153.115	3522.447	26.534-2616.639	-36.622	149.018	42.040	185.797	292.776	126.871	-0.030	44.807	MAX.P1	
1	2		1.1				2527.520	5722.597	86.029-1372.410	-22.873	106.020	49.276	290.450	347.194	169.208	-0.040	52.763	MAX.MT	
1	2		3.1				2527.520	4800.300	72.340-3831.867	-59.377	175.896	18.239	220.575	378.231	158.494	-0.040	52.763	MAX.VT	
1	3	LL 2	3.1				2799.049	4579.180	34.494-3401.631	-47.609	193.724	54.652	241.536	380.608	164.932	-0.040	58.249	MAX.VP	
1	2		5.1				2527.520	2340.844	35.836-5266.550	-80.672	257.112	40.590	139.358	355.880	242.205	22.473	52.763	MAX.ML	
1	2		5.1				2527.520	2340.844	35.836-5266.550	-80.672	257.112	40.590	139.358	355.880	242.205	22.473	52.763	MAX.VL	
1	2		3.1				1944.246	3692.539	55.646-2947.590	-45.675	135.304	14.030	169.673	290.947	121.918	-0.030	40.587	MAX.P3	

FOOTING 1 ANALYSIS/DESIGN RESULTS

FOOTING SIZE			* BAR REINFORCEMENT STEEL *						SECTION CAPACITIES *			
B	D	T	P1/PA	AS	NO.SIZE	SPAC.	PLACEMENT	MT.	VB	VP	DS	FC
14.500	14.500	4.500	0.997	1.03	19 # 8	@ 9.125	TOP TRAN	169.375	44.932	89.864	37.230	0.000
				1.45	17 #10	@10.125	BOT.LONG	248.675	46.302	92.604	38.365	0.000

NUMBER OF PILES = 14 BP = 2.000 DP = 2.000